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AG-OISPLUS-E004

Industrial Automation & Process Control

APPLICATION GUIDE
Connection to Toshiba Adjustable Speed Drives

CONTENTS

Toshiba International Corporation

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Important Information

Misuse of this equipment can result in property damage or human injury. Because controlled system applications vary widely, each user should satisfy him/herself as to the acceptability of this equipment for its intended purpose.

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Safety Precautions

This application guide is prepared for users of Toshiba programmable controller PROSEC T-series (hereafter called PLC).

Read this guide and your PLC's manual thoroughly to use the PLC system safely.

Hazard Classifications

In this guide, the following two hazard classifications are used to explain the safety precautions.

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Even when a precaution is classified as CAUTION, it may cause serious results depending on the situation. Observe all applicable the safety precautions .

Safety Precautions

⚠ CAUTION

- Read the Safety Precautions described in your the User's Manuals before using the referenced equipment
- Carefully design a fail-safe system in order to avoid unsafe situation caused by equipment failure.
- When the equipment detects an error in its self-diagnosis, it goes into an error down mode. In the error down mode, all the outputs turn OFF and the analog outputs become 0 (zero).

Contacting Toshiba's Customer Support Center

Toshiba's Customer Support Center may be contacted to obtain help in resolving any system problems that you may experience or to provide application information.
The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is:

US 800-231-1412 Fax 713-466-8773
Canada 800-527-1204
Mexico 01-800-527-1204.

You may also contact Toshiba by writing to:

Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041-9990
Attn: PLC Marketing
Or email

Manual Revisions

Please have the following information available when contacting Toshiba International Corp. about this manual.

Name: Connection to Toshiba ASDsl
Document: AG-OISPLUS-E004
Revision:

Rev No.	Date	Description
0	2013/06/15	Initial Issue (for V200)

Related Manuals

UM-OISPLUS-E001: Hardware & Specifications
UM-OISPLUS-E002: Display Programming
UM-OISPLUS-E004: Universal Serial (ASCII) Driver
UM-V200-E001: Setup and Operation (for ladder logic programming)
UM-V200-E002: Ladder Logic (how to use the ladder instructions)
UM-OISPLUS-E003: Networking

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Introduction

- About this Guide
- Who Should Use this Guide

1.1 About This Guide

This application guide explains how to set up communications between Toshiba's OIS PLUS (small operator displays/HMIs) and Toshiba's ASDs (Adjustable Speed Drives/VFDs/Inverters) It also covers communications between Toshiba's small V200 PLCs and Toshiba's ASDs.. For detailed information on individual items of equipment, please refer to the User's Manual for that device.

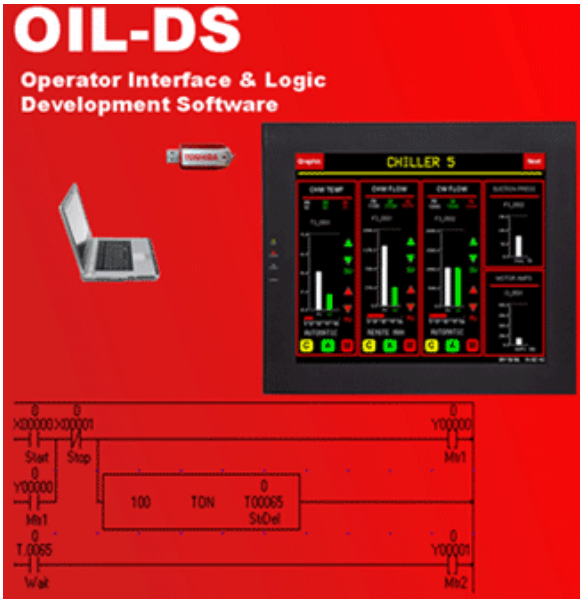
OIS PLUS Display

V200 PLC

VF-S15 ASD

1.2 Who Should Use this Guide

This guide is intended for a person developing a program to exchange data between the devices listed above. The tool for doing this is the OIL-DS (Operator Interface & Logic Development Software).



It is recommended that a thorough review of the OISPLUS network manual, UM-OISPLUS-E003 be performed prior to reading this guide.

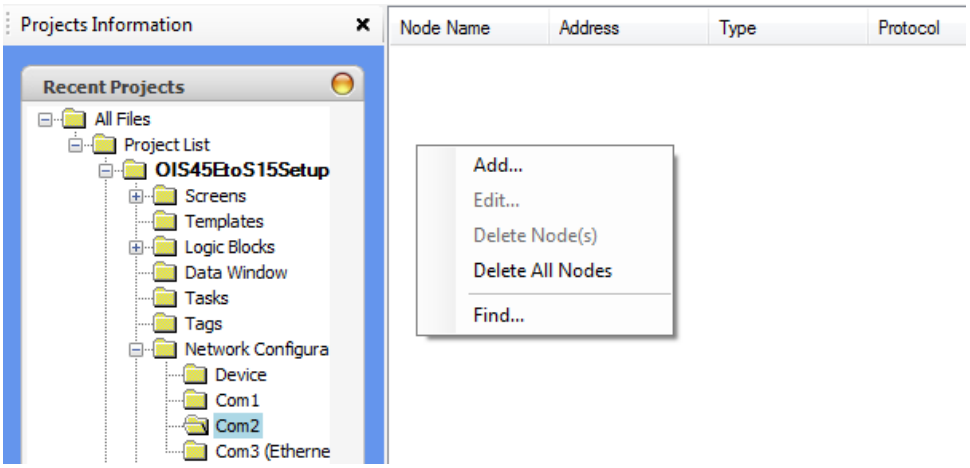
OIS PLUS SETUP

- Define the Network
- Define Tags in the Tag Database
- Create the Screens

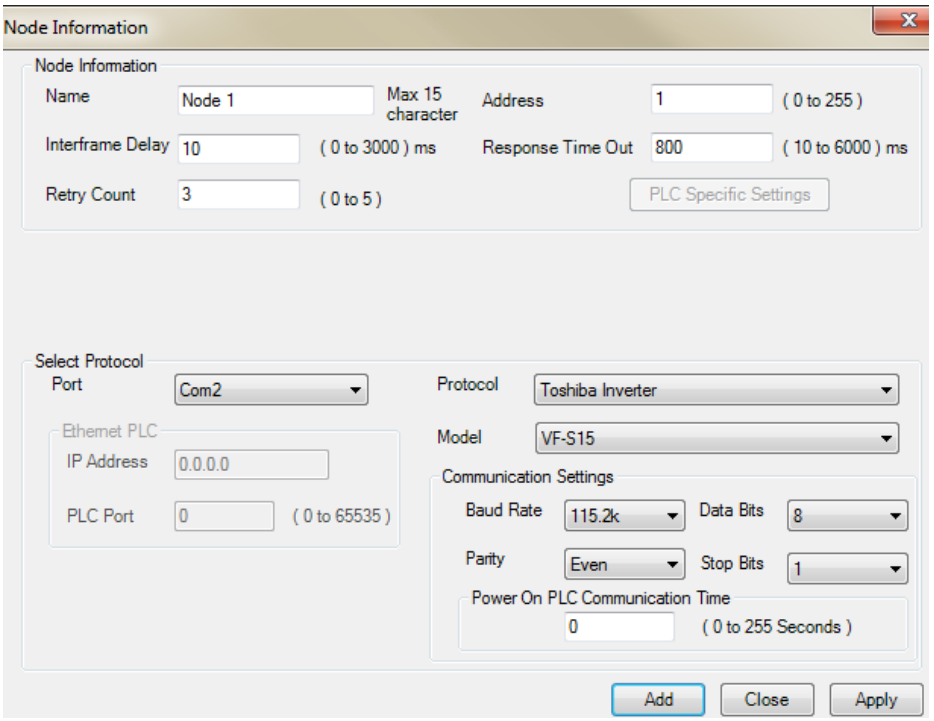
2.1 Define the Network

In this example the network refers to the ASDs connected to the OIS PLUS. Each ASD must be setup as a Node on the network.

Go to the navigation panel/network configuration and then alternate click in the setup panel. Then click on Add. Note Com 1 Is and RS232 only port.

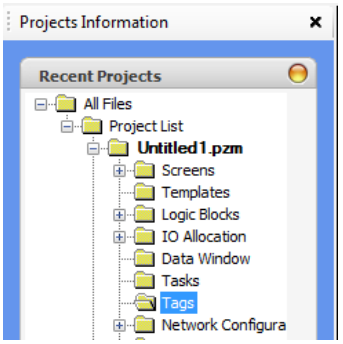


Complete the setup for the VF-S15 ASD. Then click on Add. Do this for each ASD on the network. The next ASD will be Node 2, Address 2. The OIS PLUS/V200 is always Com 0.



Note that the VF-S15 must have the same communications settings as above.

2.2 Define Tags in the Tag Database

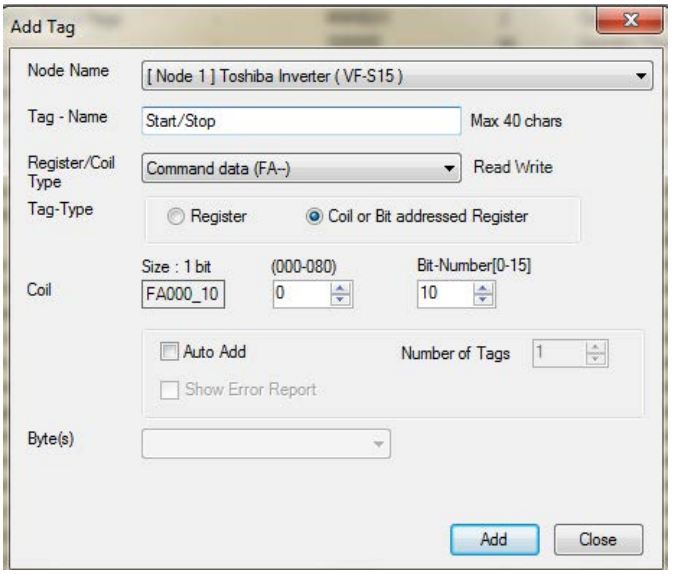


In the navigation panel, click on the Tags folder
This will open up the tag data base in the work area.
All the default tags for the Operator Panel are displayed.
Alternate click in this area and then click Add to define tags for Com2.

Define the following tags in the tag data base:

Start/Stop: FA000_10
Fwd/Rev: FA000_9
Jog: FA000_8
Monitor Run Freq: FD000
Set Run Freq: FA001

The tag below is for starting and stopping the S15



1. Node Name: Make sure the correct node is selected (default is “Operator Panel”).
2. Register/Coil Type: Select command data.
3. Tag-Type: Select Coil or Bit addressed register.
4. Coil: Select the bit number (10).
5. Tag-Name: Define the tag name, Star/Stop for example.
6. OK: Add the tag.

Use the same procedure above to setup the other 4 tags. For more information on OIS PLUS to ASD tags, see section 4.

When all tags are setup, the tag data base should look as follows:

Default Tags

Tag No	Tag Name	Tag	Attribute	Tag Address	Port	Node	Node Name	Tag Category
1	PLC mode control	2	Read Write	MW0000	-	0	Operator Panel	Default Tag
2	Run/Stop switch control (retentive)	2	Read Write	MW0003	-	0	Operator Panel	Default Tag
3	User Interrupt program Status Flags	2	Read Write	MW0031	-	0	Operator Panel	Default Tag
4	Carry bit	bit	Read Write	S00000	-	0	Operator Panel	Default Tag
5	High speed timer control bit	bit	Read Write	S00001	-	0	Operator Panel	Default Tag
6	Minute change status	bit	Read Only	S00003	-	0	Operator Panel	Default Tag
7	Hour change status	bit	Read Only	S00004	-	0	Operator Panel	Default Tag
8	Date change status	bit	Read Only	S00005	-	0	Operator Panel	Default Tag
9	Month change status	bit	Read Only	S00006	-	0	Operator Panel	Default Tag
10	Year change status	bit	Read Only	S00007	-	0	Operator Panel	Default Tag

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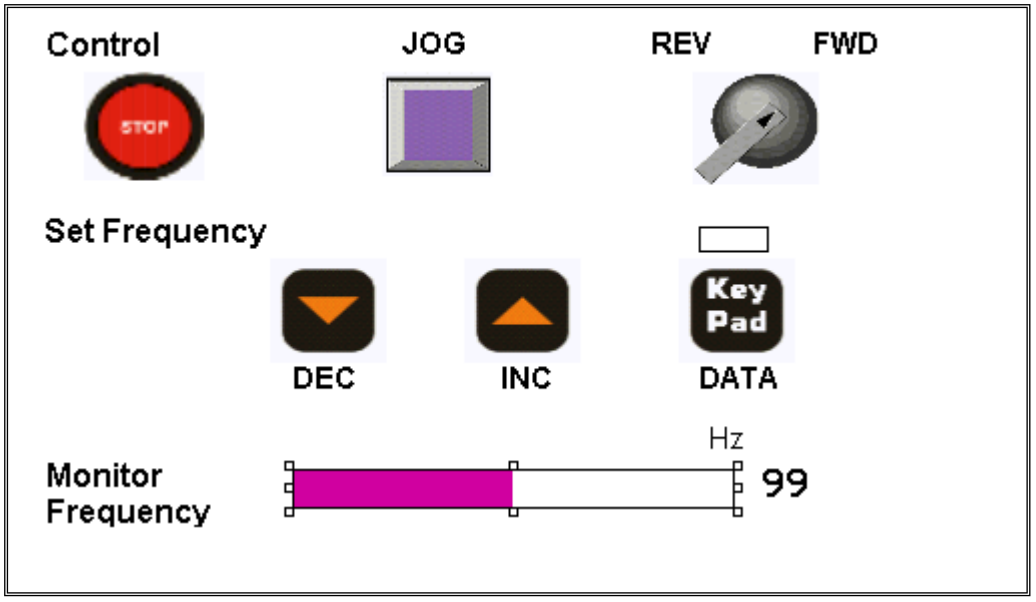
User Defined Tags

99	Start/Stop: FA000_10	bit	Read Write	FA000_10	Com1	1	Node 1	User Define...
100	Fwd/Rev: FA000_9	bit	Read Write	FA000_09	Com1	1	Node 1	User Define...
101	Jog: FA000_8	bit	Read Write	FA000_08	Com1	1	Node 1	User Define...
102	Monitor Run Freq: FD000	2	Read Only	FD000	Com1	1	Node 1	User Define...
103	Set Run Freq: FA001	2	Read Write	FA001	Com1	1	Node 1	User Define...

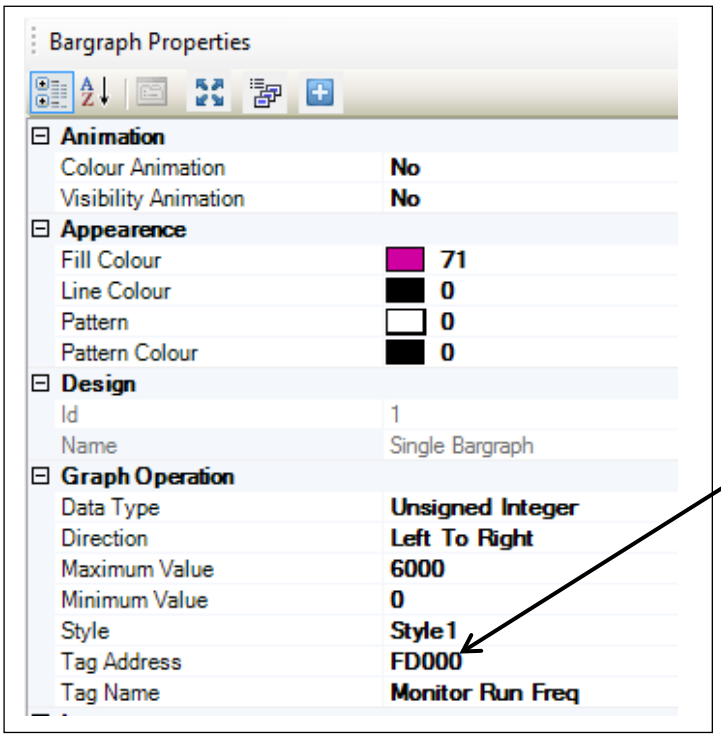
Keep adding ASD tags as required by the application.

2.3 Create the Screens

The following screen uses the tags created in the tag data base to monitor and control the VF-S15 ASD.



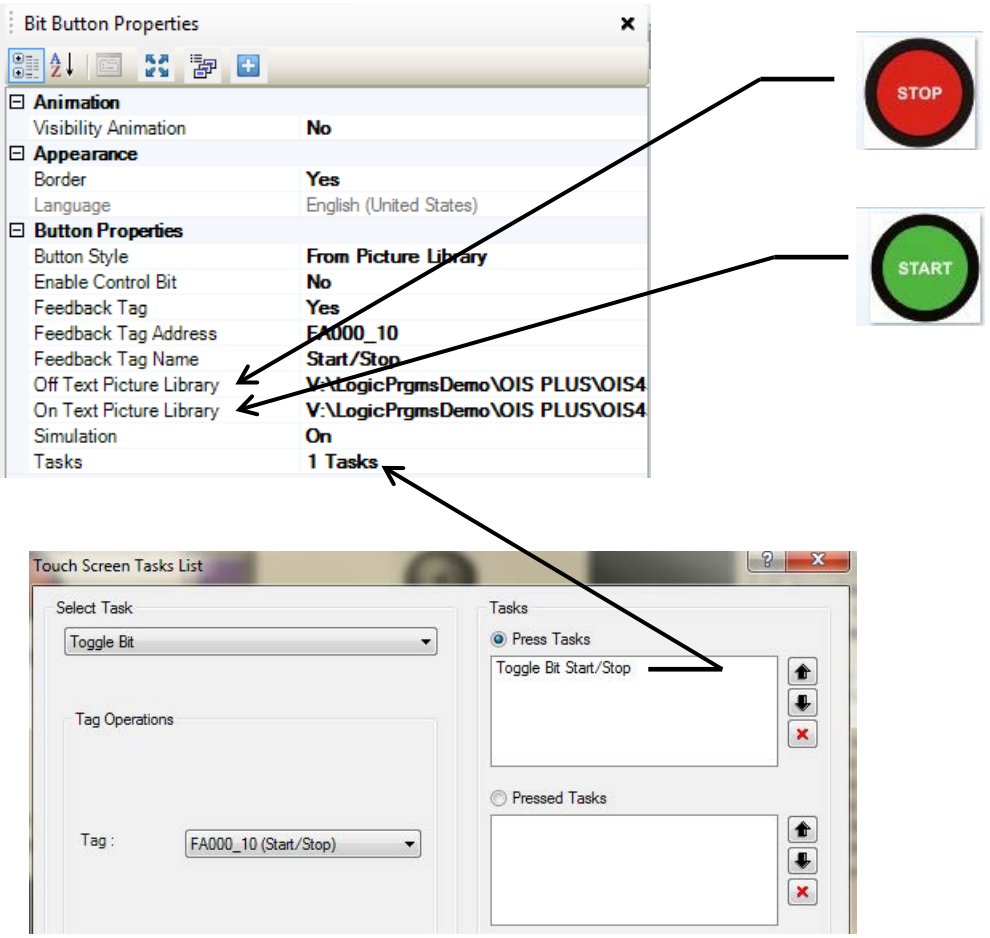
This screen shows basic control and monitoring of the VF-S15 ASD. Each of the buttons and the bar graph are setup using the properties panel to assign the tag to the object.



Tag created in the tag database and assigned to the bar graph object

The other objects are setup in a similar manner.

In the example using the start and stop buttons which alternates between two objects, it is necessary to: 1. Assign an ON & OFF conditions & 2. Create a task.



For additional information on creating screens, please see Users Manual UM-OISPLUS-E002 sections 4.1 thru 4.5.

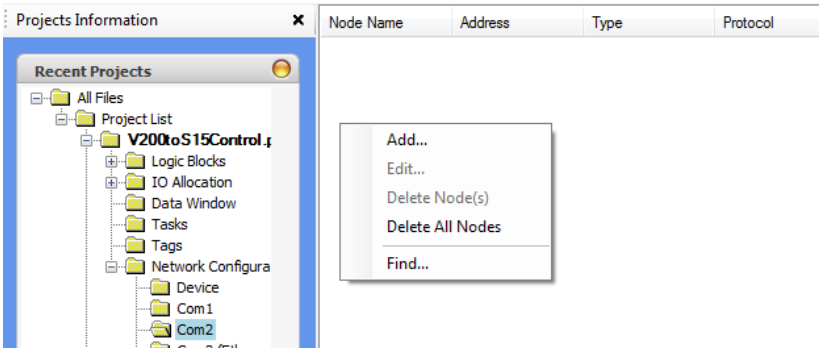
V200 PLC Setup

- Define the Network
- Create the Tags
- Global Copy Tags

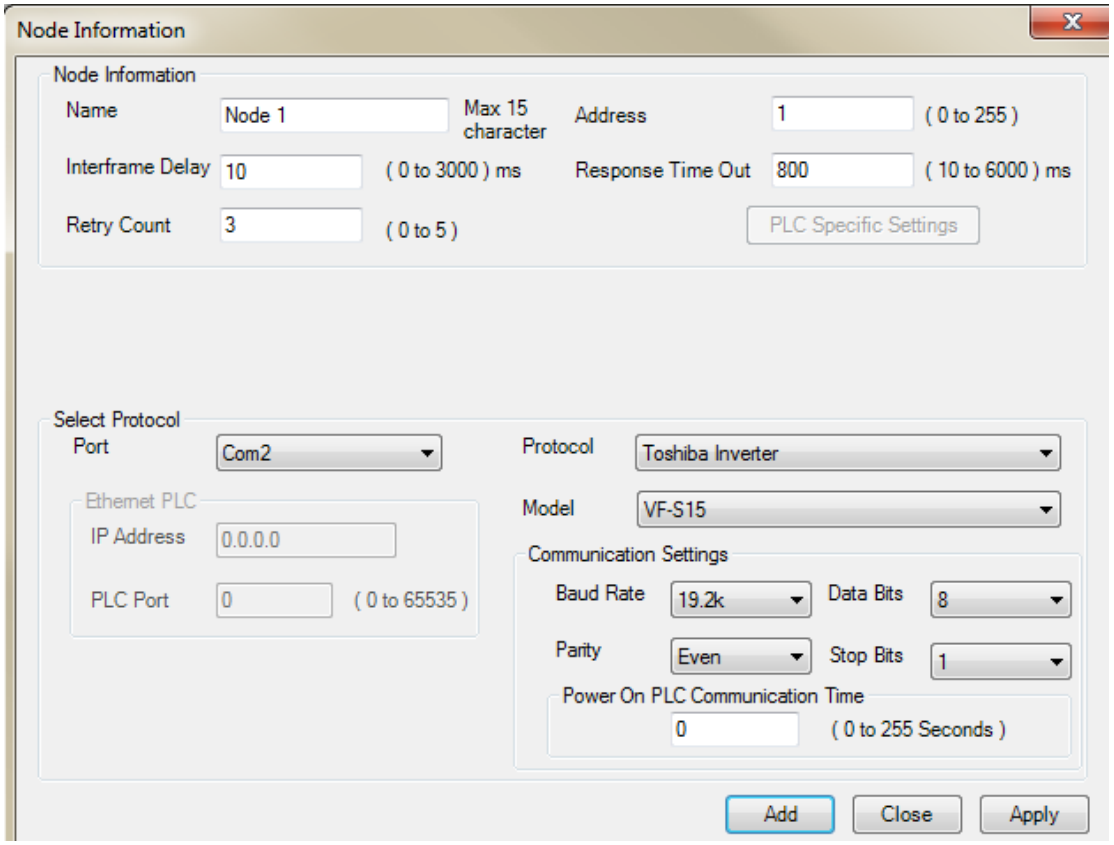
3.1 Define the Network

As with the OIS45E PLUS, the first thing to do is to setup the V200 PLC network. Setup is identical to setting up the OIS45E PLUS. Each ASD must be setup as a Node on the network.

Go to the navigation panel/network configuration and then alternate click in the setup panel. Then click on Add.

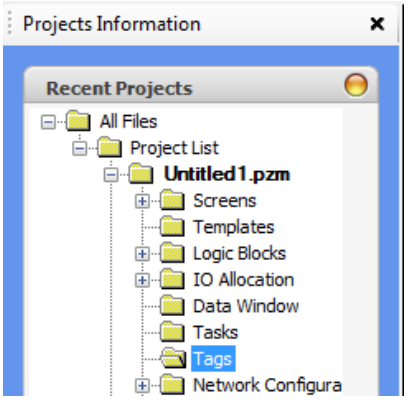


Complete the setup for the VF-S15 ASD. Then click on Add. Do this for each ASD on the network. The next ASD will be Node 2, Address 2. The V200 PLC is always Com 0.



Note that the protocol settings must match the protocol settings used in the VF-S15.

3.2 Create the Tags



In the navigation panel, click on the Tags folder
This will open up the tag data base in the work area.
All the default tags for the Operator Panel are displayed.
Alternate click in this area and then click Add to define tags for Com2.

Define the following tags in the tag data base:

Start/Stop: FA000_10
Fwd/Rev: FA000_9
Jog: FA000_8
Monitor Run Freq: FD000
Set Run Freq: FA001

Create these tags exactly as they were created in section 2.2. Tags are tags, rather they are used by the OIS PLUS displays or the V200 PLCs.

While the S15 ASD tags can be attached directly to objects in the OIS PLUS displays, they can not be used directly in the ladder logic. Another set of tags must be created for the ladder logic. These are devices and registers that can be used in the ladder program.

Start/Stop1: B04090
Fwd/Rev1: B04089
Jog1: B04088
Monitor Run Freq1: D4090
Set Run Freq1: D4092

Tag No	Tag Name	Tag	Attribute	Tag Address	Port	Node	Node Name	Tag Category
99	Start/Stop1: B04090	bit	Read Write	B04090	-	0	Operator Panel	User Defined Tag
100	Fwd/Rev1: B04089	bit	Read Write	B04089	-	0	Operator Panel	User Defined Tag
101	Jog1: B04088	bit	Read Write	B04088	-	0	Operator Panel	User Defined Tag
102	Monitor Run Freq1: D04090	2	Read Write	D04090	-	0	Operator Panel	User Defined Tag
103	Set Run Freq1: D04092	2	Read Write	D04092	-	0	Operator Panel	User Defined Tag

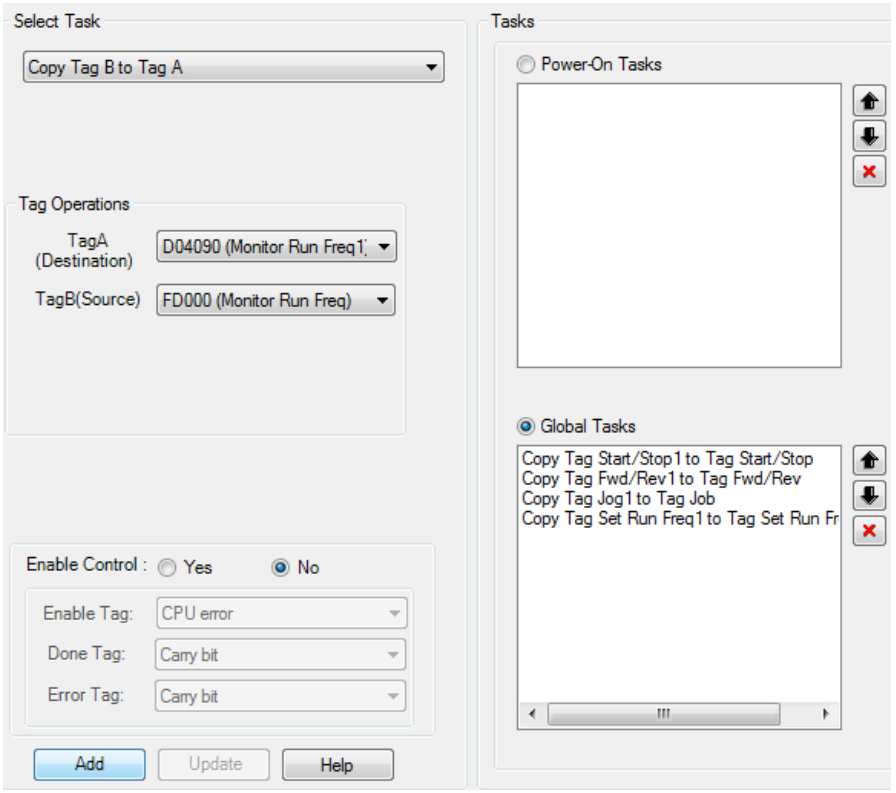
Keep adding tags as required by the application. Note that the tag numbers may change after they are entered. The OIL-DS program groups all panel tags in one number sequence and all node tags in another sequence.

3.3 Global Copy Tags

It is now necessary to create 5 global tasks, 4 write and 1 read. Use the “Copy Tag B to Tag A task to do the following:

Tag B	Write To S15.	Tag A
Start/Stop1: B04090		Start/Stop: FA000_10
Fwd/Rev1: B04089		Fwd/Rev: FA000_9
Jog1: B04088		Jog: FA000_8
Set Run Freq1: D4092		Set Run Freq: FA001
	Read From S15	
Monitor Run Freq: FD00		Monitor Run Freq1: D4090

Go to the navigation panel and select Tasks. Click on Global Tasks and create the tasks above.



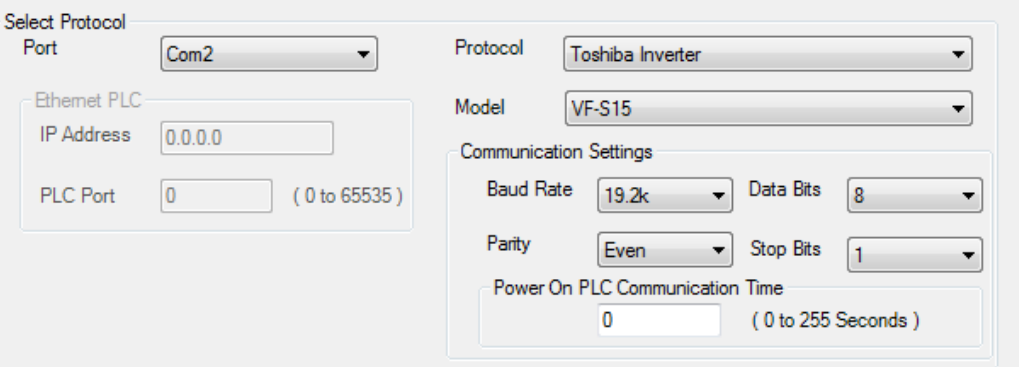
Click Add to add the last tag. This procedure must be used in native ladder for both the OIS PLUS displays and the V200 PLCs. It is necessary for moving data between the VF-S15 and the ladder program.

ASD Setup

- Match OIS PLUS Settings
- ASD Pro Setup

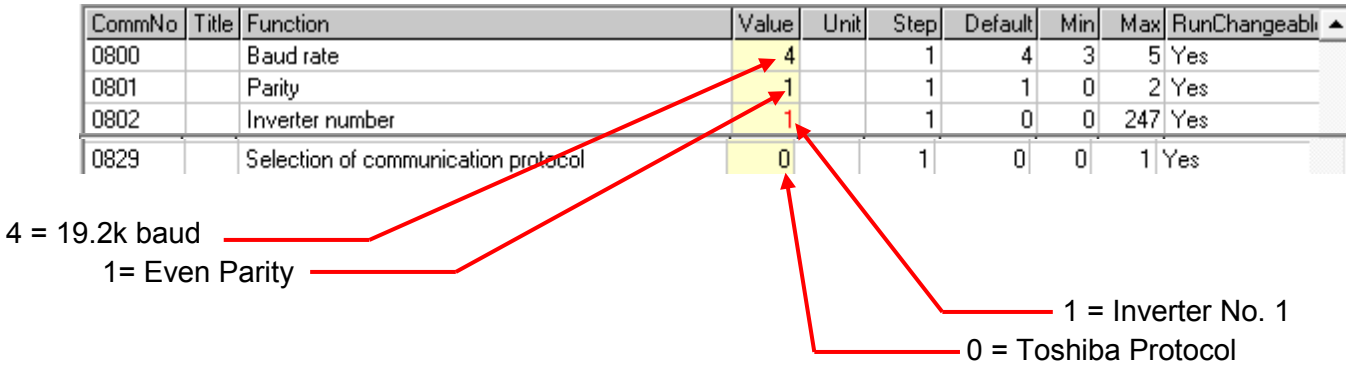
4.1 Match OIS PLUS Settings

If the following parameters are established in the OIS PLUS display or V200 PLC, the same parameters have to be setup in the ASD. The current setting in the OIS PLUS are:



4.2 ASD Pro Setup

ASD communications parameters can be set using either the ASD keypad or the ASD Pro setup software. The following example uses the ASD Pro software (download from website). Go to the Windows view.



Set the ASD up for Serial Communications:

Command Mode, ᑕΠ0d: Set at 2 = RS485 Communications
Frequency Mode, FΠ0d: Set at 4 = RS485 Communications
Check the appropriate ASD manual for other ASD models.

CommNo	Title	Function	Value	Unit	Step	Default	Min	Max	RunChang
0003	CMOD	Command mode selection	2		1	1	0	4	No
0004	FMOD	Frequency setting mode selection 1	4		1	0	0	14	No

OIS PLUS/V200 and S15 not communicating? Check the following:

1. Inverter Number **must not** be set at 0. 0 Is for the broadcast mode
2. If Comm. No F829 is visible, set it to 0 = Toshiba Inverter Protocol.
3. Make sure the OIS is connected to the ASD **with the correct cable**.
   3.1 EC-P-108C-00 for OIS PLUS.
   3.2 RC-P-108C-00 for V200 PLC.
   Note: Cut off 9 pin D-shell end of cable EC-P-108C for connection to Com2 on V200 PLC.
4. On the 1st download of the program into the OIS PLUS, make sure the Firmware box is checked when the OIL-DS download (transfer under the project menu) is selected and executed.

Selecting ASD Registers & Coils

- G9, VF-AS1, & Earlier ASDs
- VF-S15 ASD
- ASD Modbus RTU Slave

5.1 G9, VF-AS1, & Earlier ASDs

Explanation of terms.

Ret in The OIS selection list means retentive parameters. In the Toshiba inverter, two types of writes are available.

1. Writing parameters in the RAM
2. Writing parameter in the EEPROM and RAM

The EEPROM has a limited number of write cycles, so it is recommended that the parameters that need to be written into the EEPROM should be declared as "Ret parameter"
Example, to write in the basic parameter 0000:

To write it in RAM, declare it as A0000

To write it in EEPROM, declare it as R0000

OIL-DS has a selection list of all basic drive registers/ corresponding register and bit parameters. See list below with explanation.

Action	OIS list Selection	OIS Notation	ASD Notation	Action
Toggles Inverter On/Off	Run/Stop bit	AR000	Bit 10 in FA00	Read - Write
Toggles Inverter Fwd/Rev	Fwd/Rev bit	AF000	Bit 9 in FA00	Read - Write
Jogs Inverter when ON	Jog bit	AJ000	Bit 8 in FA00	Read - Write
Reset Trip	Reset Trip bit	AT000	Bit 13 in FA00	Read - Write
Set Operating Freq.	Operating Freq	AOF01	FA01	Read - Write
Mon Freq, when drive is running	Monitoring FC	AMF00	FE00	Read - Write
Stores Data	Data Registers	AD000	D000	Read - Write
Basic Settings (RAM)	Basic Parameters	A0000	F000	Read - Write
Basic Settings (EEPROM & RAM)	Ret. Basic Parameters	R0000	F000	Read - Write
I/O settings (RAM)	I/O Parameters	A0100	F100	Read - Write
I/O settings (EEPROM & RAM)	Ret. I/O Parameters	R0100	F100	Read - Write
Frequency settings (RAM)	Frequency Parameter	A0200	F200	Read - Write
Freq settings (EEPROM & RAM)	Ret. Freq Parameters	R0200	F200	Read - Write
Drive Mode settings (RAM)	Drive Mode Parameters	A0300	F300	Read - Write
Drive Mode set (EEPROM & RAM)	Ret. Drive Mode Para	R0300	F300	Read - Write
Torque Settings (RAM)	Torque Performance	A0400	F400	Read - Write

Action	OIS list Selection	OIS Notation	ASD Notation	Action
Drive Mode settings (RAM)	Drive Mode Parameters	A0300	F300	Read - Write
Drive Mode set (EEPROM & RAM)	Ret. Drive Mode Para	R0300	F300	Read - Write
Torque Settings (RAM)	Torque Performance	A0400	F400	Read - Write
Torque Settings (EEPROM & RAM)	Ret. Torque Perform	R0400	F400	Read - Write
Accel/Decel time set (RAM)	Accel/Decel Time Para	A0500	F500	Read - Write
Accel/Decel time set (EEPROM RAM)	Ret. Acc/Dec Time Para	R0500	F500	Read - Write
Protection settings (RAM)	Protection Parameters	A0600	F600	Read - Write
Protection set (EEPROM & RAM)	Ret. Prot Parameters	R0600	F600	Read - Write
Panel Settings (RAM)	Panel Parameters	A0700	F700	Read - Write
Panel Set (EEPROM & RAM)	Ret. Panel Parameters	R0700	F700	Read - Write
Communication set (RAM)	Comm Parameters	A0800	F800	Read - Write
Comm Set (EEPROM & RAM)	Ret. Comm Parameters	R0800	F800	Read - Write
Set Commands	Command Parameters	AFA00	FA00	Read - Write
Inverter Settings	Inverter Parameters	AFB00	FB00	Read - Write
Read Codes	Code Parameters	AFC00	FC00	Read only
Monitors Run Frequency	Freq Monitoring	AFD00	FD00	Read only
Monitors Drive Status	State Monitoring	AFE00	FE00	Read only

5.2 VF-S15 ASDs

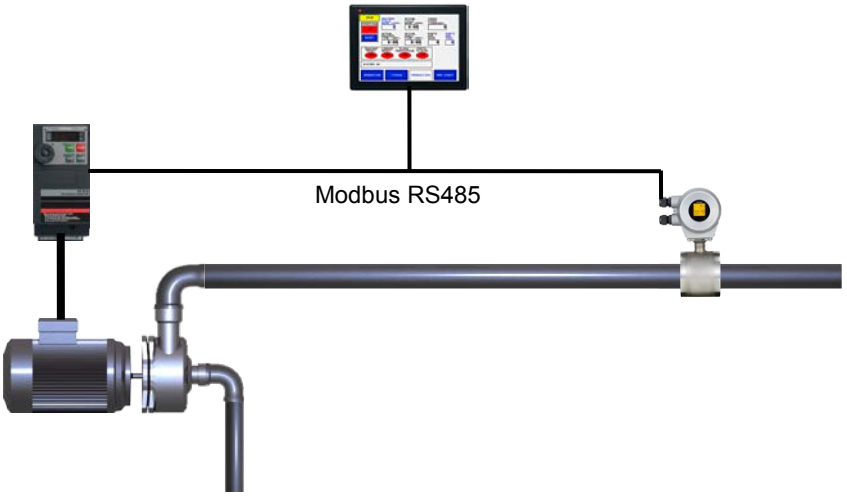
The following is the list of basic driver register/bit parameters:

Action	OIS List Selection	OIS Notation	ASD Notation	Action	# Registers
Toggles Inverter On/Off	Run/Stop bit	FA000_10	Bit 10 in FA00	R/W	
Toggles Inverter Fed/Rev	Fwd/Rev bit	FA000_09	Bit 9 in FA00	R/W	
Jogs Inviter when ON	Jog bit	FA000_08	Bit 8 in FA00	R/W	
RESET TRIP	Reset Trip bit	FA000_13	Bit 13 in FA00	R/W	
Set Operating Freq	Operating Freq	FA001	FA01	R/W	
Mon Drive Freq	Monitoring Freq	FD000	FD00	R	71
Mon Drive Status	Monitoring Data	FE000	FE00	R	92
Mon Drive Status	Monitoring Data	FC000	FC00	R	100
Basic Settings	Basic Parameters	BP000	F000	R/W	26
Extended settings	Ex Parameter	F1	F100	R/W	100
Ret. Extended settings	Ret. EX Para	Ret. F1	RF100	R/W	100
Freq Parameters	Freq. Parameter	F2	F200	R/W	99
Ret. Freq Para	Ret. Freq Para	Ret. F2	RF200	R/W	99
Operation Mode Para	Op Mode Para	F3	F300	R/W	95
Ret. Operation Mode Para	Ret. Op Mode Para	Ret. F3	RF300	R/W	95
Torque Boost Para	Torque boost Para	F4	F400	R/W	100
Ret. Torque Boost Para	Ret. Torque Boost	Ret. F4	RF400	R/W	100
Accel/Decel Para	Accel/Decel Para	F5	F500	R/W	99
Ret. Accel/Decel Para	Ret. Accel/Decel	Ret. F5	RF500	R/W	99
Protection Parameters	Protect Parameters	F6	F600	R/W	94
Ret. Protection Parameters	Ret. Protect Para	Ret. F6	RF600	R/W	94
Operation Panel Para	Op Panel Para	F7	F700	R/W	100
Ret. Operation Panel Para	Ret. Op Panel Para	Ret. F7	RF700	R/W	100
Comm Parameters	Comm Parameters	F8	F800	R/W	100
Ret. Comm Parameters	Ret. Comm Para	Ret. F8	RF800	R/W	100
PM Motor Parameters	PM Motor Para	F9	F900	R/W	85
Ret. PM Motor Parameters	Ret. PM Motor Para	Ret. F9	RF900	R/W	85

Note: Parameters that need to be written in EEPROM, should be declared as "Retentive Parameters".

5.3 ASD Modbus RTU Slave

Sometimes it is necessary to communicate with 2 or more different items of equipment on the same network. A simple example would be maintaining a constant flow in a pipe. This would require an ASD and a Flowmeter. The desired flow rate would be entered into the OIS45E PLUS. The OIS45E PLUS would read the actual flow rate from the flowmeter and then adjust the speed of the driver up or down accordingly. The system would look as follows:



In the above example even though the drive is a Toshiba ASD and the flowmeter is a Toshiba magmeter, the communications protocol for each is different. Fortunately they can both be setup for Modbus protocol allowing the OIS45E PLUS display to communicate with both the drive and the flowmeter on the same network.

The following information will cover how to setup the VF-S15 as Modbus slave communicating with an OIS45E PLUS setup as a Modbus master. For how to setup other Modbus slave devices on the Modbus network, please refer to the manufacturer (or marketing department) for that device.

5.3.1 Setup for Modbus

Both the OIS PLUS display and the VF-S15 must be setup for Modbus operation:

For the OIS PLUS, setup Com2 as a Modbus RTU master.

For the VF-S15, set F829 = 1. This automatically sets up the VF-S15 as a Modbus RTU slave. No other settings in the VF-S15 are necessary.

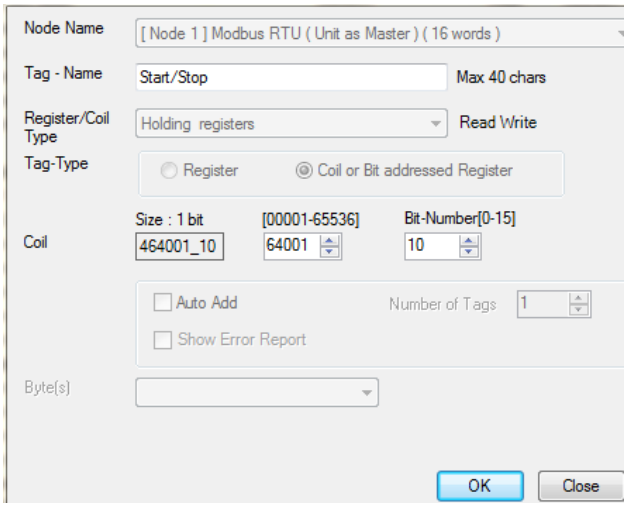
Make sure that the communications settings are still the same for both the Display and the ASD.

5.3.2 Determine Modbus Tags

The VF-S15 registers numbers are hexadecimal numbers. To use these registers as Modbus registers; convert them to decimal and add 1. The command register FA00 becomes 64001 (64000 + 1). The frequency monitor register FD00 becomes 64769 (64768 + 1). Placing a 4 in the leftmost position of the register number makes it a Modbus holding register. Thus:

ASD Register/Device	Becomes	Modbus Register/Device
Start/Stop: FA00_10		464001_10
Fwd/Rev: FA00_9		464001_9
Jog: FA00_8		464001_8
Set Run Freq: FA01		464002
Monitor Run Freq: FD00		464769

The first tag would be created as follows with the add tag wizard.



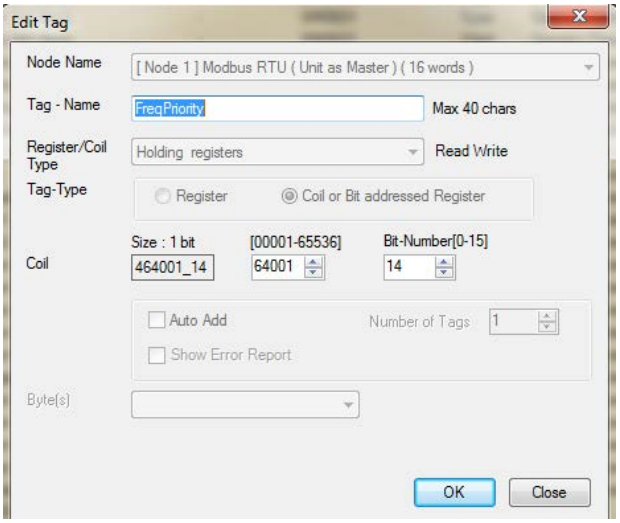
The remaining tags should be created in the same manner. On Screen 1 attach the Modbus tags to the same objects to which the Toshiba tags were attached. Also create the same tasks using the Modbus tags.

Note that if the Modbus register data is to be used in the OIS PLUS/V200 ladder program, a table of Modbus registers must be mapped to internal ladder registers. Then global tasks must be setup to copy this information back and forth. See section 3.3.

5.3.3 Global Tasks Necessary

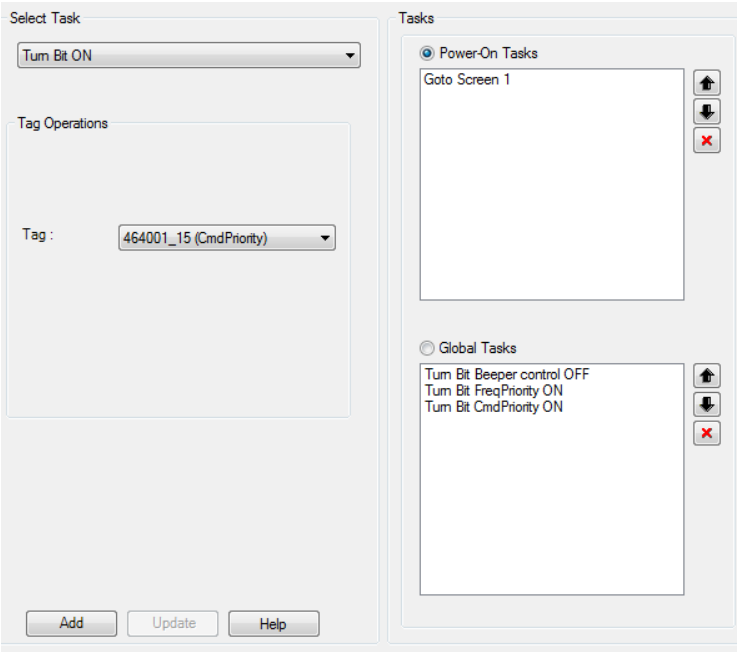
When using the VF-S15 in the Modbus mode, an extra step has to be programmed into the OIS PLUS or V200 PLC. Bits 14 and 15 in the command register FA00 must be set to ON. This gives commands from the display/PLC priority. The native Toshiba drivers do this automatically. But in Modbus mode it a separate step is required.

First, create the task.



Create the Command Priority tag, 464001_15 in the same manner.

Second, make turning on these tags a Global Task.



Now the Reads and Writes from/to the VF-S15 have priority.